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SUMMARY

ARCTIC RESEARCH OF THE MINING AND GEOLOGICAL ADMINISTRATION OF THE MAIN ADMINISTRATION OF THE NORTHERN SEA ROUTE OF THE SOVIET OF MINISTERS OF THE USSR

Symposium No 1

"Mission of the Mining and Geological Administration in the Fourth Stalin Five-Year Plan" L. Grdzelov, 3 pp

Brief survey of the demands made on the Soviet people by the postwar Five-Year Plan, and review of the contribution to be made by the Main Administration of the Northern Sea Route. These include increased mining and prospecting work in the Arctic regions, especially in respect to coal, petroleum, and the rare and nonferrous metals. Special attention will be paid to increasing the amount of geological prospecting work for rare and nonferrous metals in this area.

"The Prospects for Petroleum Discoveries in North Siberia" N. A. Gedroyts, 5 pp

The presence of liquid oil has been established at three places in North Siberia: (1) in the Nordvik-Khatanga Region (2) in the Ust'-Yenisey Region, and (3) in the region of the Kheneliken River, the right tributary of the Arga Sale River. The most significant showings of oil have been found in the Nordvik-

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Khatanga region, where a number of deposits have been explored. The following flows of oil have been obtained: up to 0.25 tons per 24 hours from the horizons of the Upper Permian in the region of Cape Il'ya, and up to 0.9 tons per 24 hours from Triassic deposits in the Yurung-Tumus (Nordvik) Peninsula. In the Ust'-Yenisey region the stratigraphic section is similar to that in the Nordvik region, and oil showings have also been observed when drilling in the Mesozoic horizons, but these showings are as yet considerably less significant than those in Nordvik, and the Paleozoic deposits have been dislocated here to a much greater extent than in the former locality. The presence of oil in the Nordvik-Khatanga and Ust'-Yenisey regions enables one to consider the whole area of the Taimyr depression as possibly oil bearing. The northeastern part of the Central Siberian platform, a vast field of development of Cambrian deposits on the slopes of the Anabar crystalline massif where the above-mentioned oil showings are known, is also of interest in searching for oil.

The possibilities of the north of the Western Siberian lowlands remain unknown to this day. Here one may expect an extension of the favorable conditions of the Taimyr depression and of the eastern slope of the Urals, but one is equally justified in presuming here the presence of an intensive folding of Hercynian age, connecting the Urals with the Taimyr, owing to which the oil deposits may not have been preserved. The large size of this area still makes it advisable to carry out suitable investigations here.

Much less promising is the eastern portion of the Arctic, east of the Lena river. The vast Verkhoyansk-Chukotsk region presents a complicated geosynclinal area produced mainly by the Mesozoic mountain formations, and the rocks here are too dislocated and metamorphosed to make the survival of liquid oil within them possible. However, the existence of detached areas is possible, one of which may be the Novosibirsk Islands.

"The Nordvik-Khatanga Oil-Bearing Region (A Short Outline of Geology and Oil Occurrence)" Yu. I. Kornilyuk, T. P. Kochetkov, T. M. Yemel'yantsev, 56 pp

Article describes the main features of the geological structure and of the oil and water occurrence (the latter in connection with oil occurrence) of the so-called Nordvik-Khatanga region, which has been thoroughly investigated during the past years. The authors report the results of observations over a wide area from the northeast coast of the Taimyr Peninsula to the Anabar Gulf, with the approximate center in Khatanga Bay and at the Nordvik Peninsula (Yurung-Tumus). The main investigations, including prospecting boring, were concentrated in a much smaller area, directly adjacent to the south of the peninsula, and including the peninsula itself, and bounded on the west and east by the Khatanga Bay and Anabar Gulf.

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The authors present a short history of part geological investigations in this region, an outline of the orography and hydrography of the region, details of the stratigraphy, and tectonic information.

Work on oil deposits in the area has shown numerous occurrences of oil and gas, both on the surface and in bore holes. The chief oil-bearing horizons have been established in the Ilyinskiy series of the Upper Permian and in the "Sub-Carnian" horizon of the Middle Triassic. The specific weight of oil in the former horizons is 0.92, that in the latter ones is 0.94. In addition, a small supply of light oil (sp gr 0.836) was obtained from the Permian deposits of the Yurung-Tumus. The greatest supply of oil was 0.9 ton per day, obtained on Yurung-Tumus from the "Sub-Carnian" horizon.

"The Nordvik Oil Field (Yurung-Tumus)" V. I. Lappo, 57 pp

The Nordvik oil field is located on the Yurung-Tumus Peninsula, 74 N 111 30 E. Communications with the mainland are accomplished in summer via the Northern Sea Route and by air, but in winter, only by air. The climate of the region, due to the very long winter, closely resembles an arid climate, the average annual rainfall reaching hardly 200 mm. The region is a tundra with low hillocks, occupying a territory between the Khatanga and Anabar rivers, which are the chief water arteries of the region.

This paper presents a brief history of geological explorations of this far-distant region of the USSR. The presence of oil in this field was established by T. M. Yemel'yantsev in 1933 during a geological investigation of the region conducted by the Main Administration of the Northern Sea Route. The work was abandoned from 1936 to 1942, when it was resumed. A description of the stratigraphy and tectonics of the region is given, in addition to a survey of the general geological structure of the area.

Owing to the complicated tectonics, five forms of oil reservoirs are possible in the oil field. A sampling in the first wells drilled in the oil field, which penetrated oil-bearing rocks in Triassic deposits, revealed a supply of oil of 0.5-0.7 tons per 24 hours, with a specific gravity of 0.943, containing up to 29 percent of light fractions. This oil has been produced from the "Sub-Carnian" horizon from the permafrost zone, which here extends down to a depth of 540 meters, the first such occurrence in the USSR. This oil can be considered to be of economic importance, in spite of its small discharge, because of the shallow depth at which it occurs. Also, the fact that here oil is being produced from the permafrost stratum greatly increases the oil possibilities of other regions. The oil obtained when sampling Permian horizons has a specific gravity of 0.829-0.846 and a content of light fractions of 50-60 percent, so that, with respect to quality, it is one of the first oil fields of the USSR.

In conclusion, the article presents suggestions for prospecting the oil field on a commercial scale.

"Physico-chemical Characteristics of the Oil From the 'Il'ya' Deposit (Kozhevnikov Bay)" P. A. Zagoretz, 9 pp

A description of oil from the "Il'ya" deposit from Well No R-1, between 1669-1675 meters. The oil belongs to the "Il'ya" series of Permian deposits. The chief physical properties of the oil are as follows: specific gravity, d_4^{20} = 0.8805; asphalt tars, 20 percent; silica-gel resins, 6.8 percent; asphaltenes, 1.45 percent; paraffin, 2.83 percent; sulphur, 1.16 percent. Distillation yielded fractions up to 150 degrees C, 6.5 percent; up to 200 degrees, 15.5 percent; up to 300 degrees, 40 percent. Laboratory distillation yielded benzene fractions up to 150 degrees, 8.5 percent; ligroin fractions, 150-200 degrees, 6.0 percent; 200-300 degrees, 18.5 percent.

The oil distillates obtained by vacuum distillation in an amount of 39.5 percent are distinguished by a high specific gravity and a higher ignition temperature at low viscosities. Fractions No 7-14 obtained in the temperature range of 404-547 degrees (at atmospheric pressure) have a solidification temperature of from + 3.5 to + 24 degrees.

From its chemical composition the oil may be referred to the methane-naphthene type. The aromatic-hydrocarbon content gradually increases from 2 percent in the 60-95 degrees fraction to 22 percent in the 250-300 degrees fraction. The content of methane hydrocarbons falls from 65 to 25 percent. In the higher fractions of 200-300 degrees, hydrocarbons of the naphthene series predominate, the content of which attains 53 percent.

"A Study of the Nordvik Oil From the Sub-Carnian Horizon of the Triassic (Well NK - 429)" S. N. Pavlova, F. S. Gofman, 15 pp

A description of the results of investigations of the oil produced from the so-called "Sub-Carnian" horizon of Triassic deposit. These results are compared with those obtained in the investigations of oil from the Il'ya series (Permian deposits) of the "Il'ya" deposit, given above.

The specific gravity of the oil is 0.930. It belongs to a type of sulphurous, resinous low-paraffin oils. Benzene is practically absent, only the ligroin fractions being present. Laboratory distillation yielded: fractions up to 200 degrees, 5 percent; fractions 200-300 degrees, 17 percent; oil fractions, 37 percent; residual bitumen, 40 percent.

The ligroin is of a lighter type, with an octane number of 61. The kerosene is first-grade, of the tractor type, with an octane number of 45 and a sulphur content

of 0.42 percent. The Diesel oil satisfies the requirements of technical standards. The fuel oil is high in resinous substances and has a low ignition temperature. The oils have a high specific gravity and a low solidification temperature.

"The Flora and Stratigraphy of the Upper Paleozoic of the North of Siberia" N. M. F. Neyburg, 17 pp

A description of new materials on the flora of the region, located by the expeditions of the Main Administration of the Northern Sea Route in the basin of the Khatanga River by V. N. Kuznetsov, and in the Nordvik Peninsula and Cape Il'ya by T. P. Kochetkov.

"New Phyllopoda From the Permian and Triassic Deposits of the Nordvik-Khatanga Region" N. I. Novozhilov, 23 pp

A description of Permian Phyllopoda taken from a deep well on the right shore of Khatanga Bay. Bore holes in the region of the Tigym River (left tributary of the Anabar River) near Lake Chaydakh, reveal Triassic forms. Only two of the forms found belong to already known species; the others are classified and arranged by the author.

"Visean and Tournasian Foraminifera From a Drill Hole at Nordvik (Turung-Tumus Peninsula)" D. M. Ramzer-Chernousova, 6 pp

Discussion of findings during the drilling of a deep prospecting well for oil, R-42, which penetrated the terrigenous deposits of the Tunguska series, and which reached limestones with bands of marls at a depth of 1,400-1,672 meters.

"Lower Carboniferous Brachiopoda Obtained by Deep Boring in Nordvik" S. V. Semikhatova, 15 pp

A description of Lower Carboniferous Brachiopoda obtained from a bore hole in Nordvik. A general list of forms is given. The presence of Lower Carboniferous rocks, until now unknown in this region, is established on the evidence of this fauna, and the article discusses the subdivisions of the rocks.

Symposium No 2

"The Alkaline Rocks of the Northwestern Part of the Area of the Development of Siberian Traps" B. M. Kupletskiy, 34 pp

The author gives a detailed quantitative mineralogical analysis of the characteristics of these rocks, as well as of their chemical composition. He discusses the question of their origin, emphasizing their close genetic

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relationship with traps, and arrives at the conclusion that they have been formed in the process of a crystallization differentiation of trap magma and that phenomena of assimilation of carbonate rocks played no essential part in the formation of the vein series studied.

"The Quaternary Deposits of the Northwestern Part of the Central Siberian Tableland" V. N. Saks, 28 pp

The oldest among the Quaternary deposits of the Central Siberian tableland appear to be plastic clays locally preserved on the summits of the table mountains in the region of the Lower Tunguska. They were formed under conditions when the tableland was still but slightly raised.

The interglacial time was characterized by a transgression of the sea in the lower course of the Yenisey, reaching 67 50 N. Within the tableland, river terraces 120-180 meters high on the Lower Tunguska, and 100-150 meters on the Kheta and Kotuy were formed.

The last glaciation on the Central Siberian tableland has a distinctly pronounced valley character, and was developed under conditions resembling the present relief.

At the beginning of the postglacial epoch in the Norilsk depression, a large lake was formed in which bedded clays were deposited up to 45 meters in thickness.

"Iceland-Spar Deposits in the Basin of the Lower Tunguska River and the Prospects for their Industrial Utilization" G. G. Moor, 32 pp

Geological explorations carried out in the basin of the middle course of the Lower Tunguska River in recent years show that a vast lava field, whose area, according to preliminary estimates, reaches 350,000 to 400,000 sq km, is located in the northern parts of the Siberian platform. The most valuable of the Iceland-spar deposits known at present are situated in the mouths of the Vivi and the Kochechuma. At present four deposits of Iceland spar and a number of smaller spar-bearing occurrences are known in the middle course of the Lower Tunguska. From prospecting data the most valuable from the economic standpoint are the deposits of Skal Suslov, Gonchak, Poludahit, and Shpat. The assumption is made that there is a large spar-bearing region located within the trap area of Siberia.

"The Yurung-Tumus Coal Deposit (Nordvik)" N. I. Kusov, V. I. Lappo, 14 pp

The article describes the geological structure of the brown coal deposits situated on the isthmus connecting the Yurung-Tumus Peninsula with the mainland. The authors also report materials characterizing the quality of the coal, as well as some hydrogeological data necessary for the mining of the coal.

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This deposit is only one of the many already known deposits of Cretaceous age occurring both in the Nordvik-Khatanga region and in the adjacent territories of North Siberia. Geological resources of these deposits are practically unlimited, and in the described deposit they reach millions of tons.

"Chemical Characteristics of and Methods of Utilizing Tiksi Coal (Tiksi Bay, Yakutsk ASSR)" N. N. Dolgopolov, 5 pp

Chemical investigation of samples of coal from a deposit on the Soy River (Tiksi Bay) has established that the coal is brown, low in sulphur, with the moisture content of some samples reaching over 40 percent. The coal may be used to meet the demands of the Tiksi port. To improve the quality of the coal and make possible its use in the Navy, the coal may be dried and made into briquettes with a binding material consisting of the higher fractions of the primary tar of the Olenek boghead.

"Fuel Suspensions from the Olenek Boghead Coal" N. N. Dolgopolov, 7 pp

Stable and high-grade fuel suspensions are obtained from the Olenek boghead. The stability of the suspensions is determined chiefly by the low specific gravity of the boghead, the value of which approaches that of the specific gravity of the heavy grades of petroleum products. A low ash content of the original raw material, low sulphur and water content, and a high calorific value make the boghead a highly valuable component for fuel suspensions.

The use of boghead fuel oil or boghead petroleum fuel suspensions may be an efficient method for increasing the resources of liquid oil fuels.

"Research in Semicoking Olenek Boghead Coal" N. N. Dolgopolov, 11 pp

Bogheads (the Charchik deposit) which upon semicoking in a Fischer retort yield up to 73.1 percent of primary tar occur in the lower course of the Olenek River.

A study of the properties of primary tar shows that it possesses a nearly neutral character and can be used directly as a high-grade substitute for natural oil. The recovery of the light fractions ranges for different specimens of tar from 39 to 54 percent, the properties of the benzene, kerosene, and ligroine obtained very closely approaching the requirements of the corresponding standards for oil products. The fuel oil of primary tar can be successfully used as a raw material for the production of lubricating oils.

Experiments on the stabilization of light fractions of primary tar with zinc chloride have yielded stable

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products with a low tar content, etc. In conclusion, the article gives considerations concerning the choice of the type of furnace for semicoking the Olenek boghead.

"Solution of Boghead Coal from the Olenek Deposit" A. Vavul, I. Rapoport, 9 pp

Work carried out shows that the Olenek boghead coal may be dissolved in the kerosene fraction boiling in the range of 160 to 300 degrees.

The resulting solution upon separation of the undissolved residue, distillation of benzene and subsequent cracking of the coal solution, makes it possible to obtain benzene and fuel oil as ultimate products.

The process of solution of the Olenek boghead, carried out according to this scheme, yields about 30 percent benzene and about 34 percent fuel oil, as calculated for the combustible mass of the boghead, a complete return being secured of the fraction boiling within the range of 160-300 degrees necessary for the solution.

"The Nordvik Deposit of Rock Salt" V. I. Lappo, N. I. Kusov, 38 pp

The article presents results of prospecting work in the western part of the salt dome core on the Yurung-Tumus Peninsula (Nordvik) in the southeastern part of the Laptev Sea. The study of this region was begun in 1933 in connection with oil prospecting. Prospecting and exploitation of the salt deposits were interrupted in 1936, and resumed in 1942.

Article presents location, form, and space situation of the salt body, and chemical and petrographical data on the deposits. Conclusion deals with the economic aspects of mining and utilizing Nordvik salt.

"The Geology of Mirabilite of the Nordvik Deposit" K. A. Baranov, 11 pp

Description of two types of mirabilite occurring on the Yurung-Tumus Peninsula. Data on the composition and location of the main mirabilite deposit which may be of economic interest. Conclusions on the problem of the origin of the various mirabilite deposits of this area.

"Permafrost Observations in the Dikson Area" N. A. Velaine, 14 pp

The author observed frozen ground and buried ice during investigation work on the Arctic Coast in the Region of Dikson Island. The data obtained are among the first available for this area.

Inspections of mines showed that occasionally snow sheets occur under the solid ice in permafrost ground.

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It is also seen that human activity has a definite bearing on the surface conditions, especially when the permafrost zone occurs close to the surface.

Figures given show the structural forms of permafrost ground, cross sections of the mines inspected at various dates, and photographs of cuts into the permafrost.

"Underground Water and Permafrost in the Region of Anadyr and Ugolnaya Bay" P. F. Shvetsov, 10 pp

In the lower Anadyr region permafrost is universally distributed, the thickness of the permafrost layer averaging about 120 meters, and the temperature of the soils and rocks about minus 5 to 6 degrees C.

Underground waters in this region may be classified according to four divisions:

1. Water of the annually thawing super layer of soil, thawing as deep as 0.5-0.8 meters

2. Water accumulating below lake and pond bottoms in the depressions on the top surface of the permafrost layer

3. Strongly mineralized underground water which does not freeze at temperatures higher than minus 6 degrees C. This kind of underground water owes its origin to percolation of sea water through the soil, the total mineral content of the water increasing because of evaporation and freezing processes.

4. Underground water of permafrost strata and lenses of ground ice. They are up to 5 meters thick and owe their origin to freezing of water in lakes to the bottom.

In the Ugolnaya Bay the thickness of the permafrost stratum varies from 60 to 120 meters and temperatures of the permafrost ground are not lower than minus 3.2 degrees C. Drill holes reached fresh pressure water occurring below permafrost rock.

"Ice in the Permafrost Ground in the Anadyr Region" P. A. Solov'yev, 19 pp

The article describes buried ice sheets which are interbedded with layers of permafrost. This ground ice may be classified according to the origin of its formations into six groups.

The most interesting kind of ground ice is represented by strata and lenses up to 5 meters thick. In agreement with conclusions of some other investigators, the writer classifies this kind of ground ice as buried ice sheets of lacustrine origin. Some ground-ice formations of large dimensions are regarded as buried snowdrifts.

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The author observed a peculiar kind of ground ice in the permafrost silt deposits, where the ice content exceeded the ground volume by 50 percent. The ice inclusions were represented by ice veins and needles. The observations indicate that ground ice of this type is formed upon the freezing of lake and lagoon bottoms.

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